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TARGET: Taking Aim Towards the Future

THE AUTHORS

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ABSTRACT

This paper describes the Technical Assessment, Repair Guidance Evaluation Team (TARGET) program which COMNAVSURFLANT sponsors for all surface ships in the U.S. Atlantic Fleet. The TARGET program, composed of three visits (TARGET, AEC, HORSE), is designed as a continuous maintenance tool that provides material condition assessment and expert repair guidance reported entirely in a 4790/2K format. TARGET program visits are managed and technically staffed by engineers, technicians and sailors from FTSCLANT with overload support from In-Service Engineering Activities (ISEAs) and contractors.

TARGET visits consolidate many inspection programs into a single material assessment visit for all Hull, Mechanical and Electrical (HM&E) systems and several Combat Systems support systems. TARGET visits are scheduled in conjunction with the enhanced Combat Systems Readiness Reviews (CSRRs) on a once per maintenance cycle basis or approximately every twenty-four months. In most cases, these visits occur before deployment, providing a pre-deployment assessment and repair visit as well as technical recommendations for Intermediate ("I") and Depot ("D") level screening to Fleet Maintenance Availabilities (FMAVs) and Depot-level repair availabilities.

Smaller, TARGET-style, tailored Assessment of Equipment Condition (AEC) visits may be scheduled following deployment and prior to the ship's next availability. Scheduling an AEC visit depends upon the needs of the Port Engineer and ship's Engineering Department in preparation for the pending availability. AEC visits are sponsored by Commander, Naval Sea Systems Command (COMNAVSEASYSKOM).

Another smaller version of TARGET is the HM&E Operational Readiness Systems Evaluation (HORSE) visit which is scheduled after a major availability and prior to CART II. These visits are sponsored by COMNAVSURFLANT and executed by FTSC/LANT in cooperation with Engineering Training Group (ETG) and Propulsion Examination Board (PEB). The HORSE visit primarily focuses on ensuring that the equipment is operational for Ship's Force to train with during the inter-deployment training cycle.

INTRODUCTION

As the fleet force structure changes to meet the reductions in the Defense budget, the methodology and management processes used by the fleet maintenance community are changing as well. Concepts such as Regional Maintenance and Continuous Maintenance comprise the future vision of fleet maintenance overall, with an increasing emphasis being placed on process integration and definition. One of the current efforts to streamline maintenance processes and become more efficient is the TARGET program.

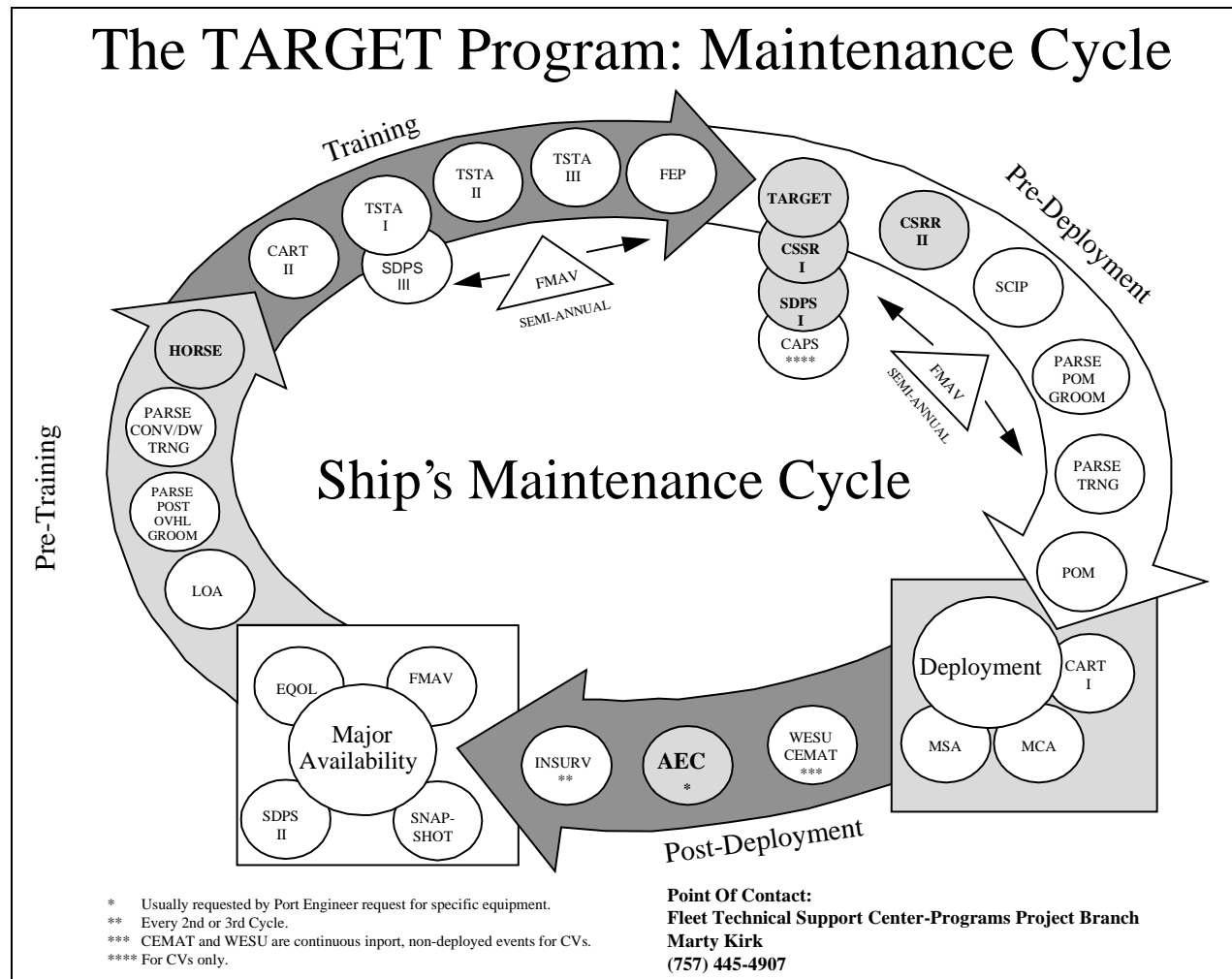


Figure 1 - The Maintenance Cycle

The TARGET program is a condition-based assessment program for Hull, Mechanical and Electrical systems and equipment and outlined in the Joint Fleet Maintenance Manual (JFMM). It is a direct outgrowth from a plan by COMNAVSURFLANT to consolidate the numerous redundant inspections and assessment visits that were paralyzing ships of the U.S. Atlantic Fleet. TARGET

is sponsored by COMNAVSURFLANT and COMNAVSEASYSCOM while being executed by FTSC LANT. Designed as a two-week visit (three weeks on larger ships), TARGET visits assess equipment, provide technical repair expertise and deck-plate level maintenance training. The combat systems equivalent program is the Combat Systems Readiness Review (CSRR). [1] Presently both programs are scheduling their visits to be co-located to the maximum extent possible.

By consolidating inspections and assist visits into a single two-week TARGET visit, the impact on the ship has been greatly reduced. Equipment and systems that were assessed several times by different programs are now assessed only once. Initial data shows that TARGET has reduced the overall duration of shipboard HM&E inspections and assist visits by 78 percent with a resultant cost savings of 48 percent.

The current goal of the TARGET program is to provide each ship with a TARGET visit once per maintenance cycle prior to the ship's deployment. The intent is to ensure that the ship's HM&E and combat systems support equipment is fully functional, properly screened for required repairs prior to deployment or for the next major repair availability following the deployment. In this manner, TARGET supports the overall proposed maintenance cycle (Figure 1), which is designed to ensure each system is assessed at least once per cycle by either TARGET, SNAPSHOTS, or by ship's force Material Self-Assessment (MSA).

To manage this process, COMNAVSURFLANT and SUPSHIP Code 200, developed an equipment and system listing for every SWLIN of each surface ship class. This listing, or Master Assessment Index (MAI), contains not only the systems and activity responsible for assessing the equipment, but also the assessment procedures that are used as well. The majority of the operational assessment checks are accomplished during TARGET visits help prepare the ship for both the upcoming deployment and future availabilities. SNAPSHOTS is a process for tracking and analyzing the conditions of slower degrading systems, i.e., tanks, piping, bilges, ventilation, rudders, etc. SUPSHIP Code 200 conducts the assessments for SNAPSHOTS equipment during TARGET visits and availabilities when some of these systems are being repaired or as they become accessible.

TARGET has been a key factor in validating historical 3-M and Casualty Report (CASREP) data used in the Top Management Attention/Top Management Issues (TMA/TMI) process. TMA/TMI uses this data and technical insight from the waterfront technical community to help identify the top material readiness systems/equipment that are the major burden for Fleet maintenance. Problems, solutions, and implementing actions are the heart of the TMA/TMI process and TARGET assists with all three.

WHY TARGET BEGAN; A NATURAL PROGRESSION

TARGET started as part of a COMNAVSURFLANT Total Quality Leadership (TQL) process improvement inquiry by VADM J. P. Reason, who asked all ships "What can COMNAVSURFLANT do to help the Fleet?" The overwhelming response was a plea to reduce the number of inspections inflicted upon the ships during their limited time in port. Subsequent research indicated that an average ship endured an estimated 130 inspections and assist visits during a standard 36-month cycle. The conclusion reached was that the ships were right, and something had to be done.

At the same time, the shape of waterfront maintenance was undergoing a significant change. NAVSEACENLANT, as a field activity of COMNAVSEASYSCOM, had long been providing waterfront technical expertise to the fleet. In 1993, NAVSEACENLANT was merged with the Mobile Technical Units (MOTUs) and later NAVSURFLANT Performance Monitoring Teams (PMTs) to become Fleet Technical Support Center, Atlantic, which reports to Commander-in-Chief, U.S. Atlantic Fleet (CINCLANTFLT). This gave the Fleet Commander direct control of the top technical support expertise on the waterfront, and made this expertise more easily available to the Type Commanders, i.e., COMNAVSURFLANT.

The waterfront technical expertise and "one-stop shopping" concept of FTSC LANT was the key to resolving COMNAVSURFLANT's problem regarding too many HM&E inspections. Together, FTSC LANT and COMNAVSURFLANT developed a plan to integrate many of the various material condition assessment programs into a single, more concentrated assessment visit called TARGET. Programs immediately consolidated included AEC, Auxiliary Systems Readiness Review (ASRR), and Gas Turbine Readiness Review (GTRR). Programs later phased into TARGET include Combat Support Systems Repair, and Training (CSSRT), portions of Pre-Overhaul Test and Inspection (POT&I), and portions of Sonar Dome Pressurization Operation and Training (SPOT). The focus of ship visit philosophy also shifted from merely providing "laundry lists," to actually working with the ship's force to assess equipment, determine required repairs, locate repair parts, and repair discrepancies; all while providing deckplate maintenance training to the crew.

To that end, five guiding principles were established as guidelines for program development:

(1) The TARGET program uses standard Navy support processes, such as 3-M and the supply system. If a current process is unsupportive or fails to provide the needed support, the TARGET program collects the appropriate data and makes recommendations for process improvement and for System Command (SYSCOM) or COMNAVSURFLANT attention as needed.

(2) The TARGET program visits uses standard assessment procedures for consistent results and to support the drive for Navy-wide standard assessment procedures. The assessment procedures from the AEC program were the baseline for TARGET procedures. Changes and corrections are routed through Naval Surface Warfare Center, Carderock Division (NSWC CD), for technical review and submission into the 3-M system.

(3) The TARGET program does not produce any material discrepancy list for action, nor any graded report for the ship's chain of command. All discrepancies are documented within the 3-M system on 4790/2Ks. The TARGET team enters the data into the ship's SNAP (Shipboard Non-tactical Automated data Processing) system to the maximum extent practical via the ship's officers.

(4) TARGET program efforts onboard focus on equipment assessment, technical assistance for repairing discrepancies, and deckplate level maintenance training. Logistics support personnel properly identify, locate, and expedite parts delivery for repair accomplishment during the visit.

(5) Measures of effectiveness are prepared and analyzed during regular program reviews to ensure the process remains in a state of continuous improvement.

The first TARGET visit was conducted in March 1993, and there have been over 145 visits as of August 1997. The program has changed in structure, administration, composition, and scope since its inception, but the focus of helping the ships "get better" has remained unwavering. It is that clear focus, summarized in Figure 2, that has been the main reason for the success of the TARGET program.

- Use standard Navy support processes
- Use standardized assessment procedures
- Document all discrepancies on 4790/2K
- Focus on equipment assessment, repair technical assistance, and deckplate maintenance training
- Use Measures of Effectiveness for continuous process improvement

Figure 2 - TARGET Guiding Principles

THE TARGET PROCESS; EVERYONE IS INVOLVED

As shown in Figure 3, the TARGET process is composed of five key phases: Visit Scheduling, Visit Planning and Preparation, Visit Execution, Post-Visit Analysis, and Process Management. Each phase and its subprocesses depend on one another and may occur concurrently, especially if there are a number of TARGET visits ongoing at the same time within the same geographic area. This process is applicable to all three of the TARGET program visits.

The process of conducting TARGET program visit begins with initial scheduling of the visit by COMNAVSURFLANT in conjunction with requests and inputs from the ships, squadrons, and groups of the U.S. Atlantic Surface Fleet. These initial dates are checked with FTSCANT to ensure that sufficient resources are available to conduct the visits as scheduled. Once the visit period has been confirmed and the FTSCANT visit Technical Director is assigned, actual visit planning and preparation begin.

The first step, and the basic building block of the entire visit process, is the development of the equipment assessment list. This list is compiled from the basic ship class core list defined by the MAI and coordinated with the ship's Engineer Officer, COMNAVSURFLANT type desk officers and port engineers to ensure that the equipment list meets the needs and concerns of the ship. Liaison is also conducted with the local Regional Support Group (RSG) and SUPSHIP representative to check for any scheduled maintenance, repairs, or alteration that could interfere with the conduct of the visit. Specific equipment can be designated for special attention to validate anticipated major repair work that the port engineer or type desk officer may wish to defer.

Once the equipment list has been refined, the appropriate technical personnel are assigned to TARGET teams built around a grouping of related equipment. Each equipment team has a team leader who is responsible to the TARGET visit Technical Director for the assessment, repair assistance, and deckplate training accomplished during the visit. The applicable assessment procedures are consolidated during the planning and preparation phase for distribution to the TARGET team members.

The visit Technical Director uses the equipment list and together with the ship's Engineer Officer, prepares a schedule of events or test agenda for the operational testing of equipment. The goal is to quickly complete as many assessments as early as possible. This allows for the maximum parts procurement and repair time. The test agenda also serves to coordinate assessment checks to minimize the down time for static tests and avoid conflicting demands for operational testing. Coordination between the Engineer Officer, Combat Systems Officer, and Technical Director is critical for this to occur.

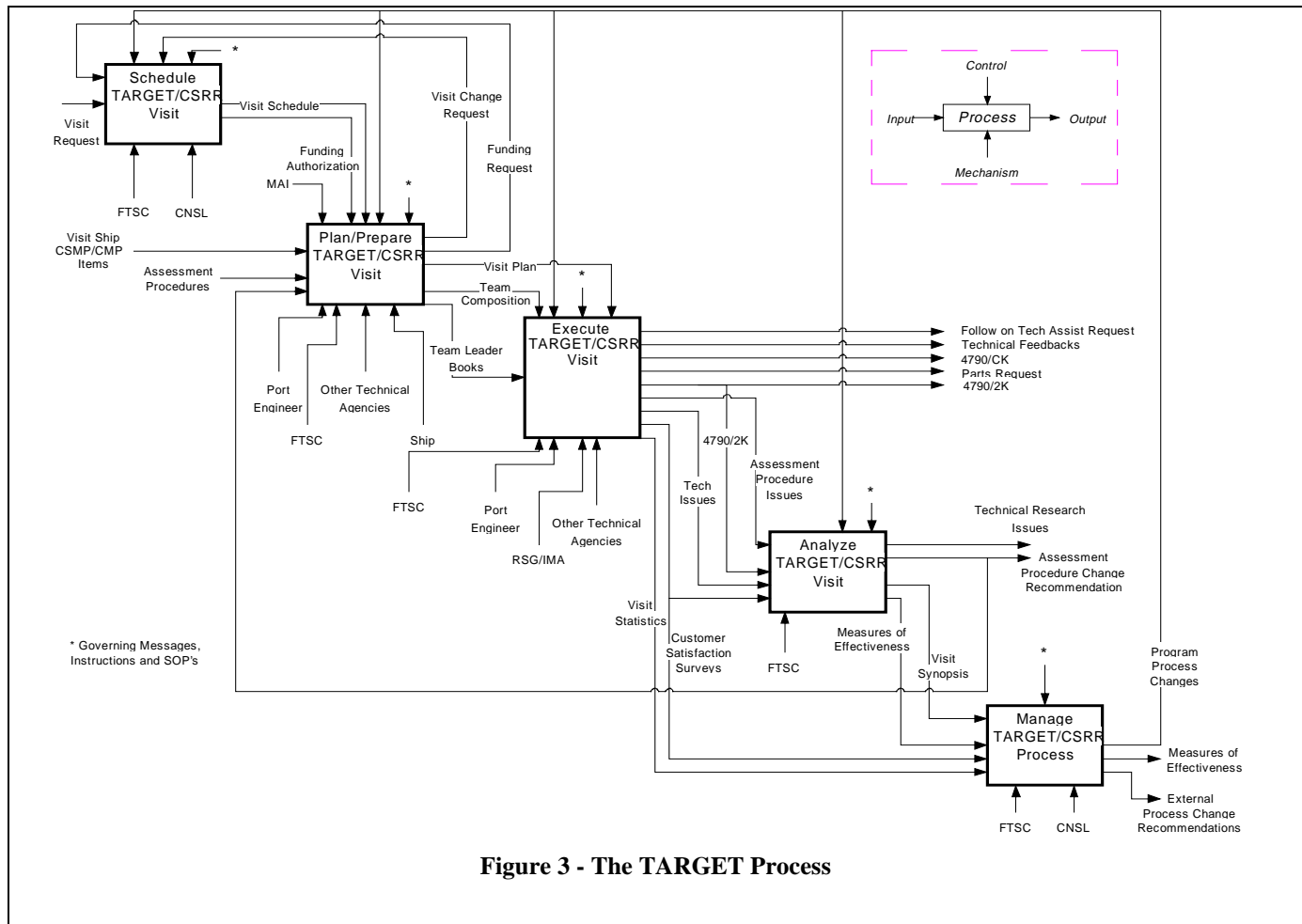


Figure 3 - The TARGET Process

TARGET team leaders prepare for the TARGET visit by reviewing the equipment for which their respective teams are responsible, and by familiarizing themselves with the latest SHIPALTs, MACHALTs, TMA/TMI information, and class problem data applicable to their equipment. This research provides valuable insight into any of the problems or difficulties that may be encountered during the assessments.

In addition, visit Technical Directors review results from previous TARGET program visits to become familiar with potential problems. This prior knowledge also allows the Technical Directors to check for any problems that are still outstanding which the ship may need additional help in correcting.

All of these preparations pay dividends when a TARGET program visit finally begins. Each of the equipment team members are matched with their counterparts from Ship's Force and the assessments begin. During the assessments, team members review existing work requests (4790/2K) drawn from the Current Ship's Maintenance Project (CSMP) and from the Class Maintenance Plan (CMP) for the equipment being assessed. Each 4790/2K is compared with the equipment's actual material condition to see if the work needs to be accomplished as written, if the work requirement needs to be rewritten, or if the work has already been completed. This helps the Ship's Force "scrub" their CSMP, which is particularly valuable if the ship has an OPPE (Operational Propulsion Plant Examination), LOE (Light-Off Examination), or INSURV (Board of Inspection and Survey) visit on the horizon, as well as planning for post-deployment availabilities.

While working side-by-side with the sailors, TARGET team members provide deckplate level maintenance training. Most of this training occurs simply by working side-by-side, with the sailors asking questions, but some occurs when the TARGET technical experts take the extra time to show sailors the "tricks of the trade" on troubleshooting techniques or how to spot unusual symptoms which are good indicators of potential problems. FTSC/LANT technicians possess (on the average) twenty-one years of technical experience, which offers a considerable resource for the sailors to access and learn from. NSWC CD representatives also support TARGET on occasion, allowing these in-service engineers an opportunity to "meet the fleet," work with their FTSC/LANT counterparts, and impart ISEA expertise to the sailors.

On a daily basis, all assessment teams report their findings on TARGET-generated, A-coded 4790/2Ks, which are entered into the CSMP by TARGET personnel. This relieves the Ship's Force of the administrative burden of documenting discrepancies discovered during the visit. Each 4790/2K is reviewed by the TARGET Technical Director and discussed with the ship's Commanding Officer and Engineer Officer, RSG representative, local IMA ship supervisor, and COMNAVSURFLANT port engineer prior to formal CSMP entry. This daily review of TARGET 4790/2Ks is typically held in the wardroom in conjunction with the CSRR review. All major findings are discussed, parts status reviewed, and appropriate repair screenings determined. The result is a maintenance decision for every 4790/2K discussed. These decisions are documented in the CSMP for the Ship's Force review, approval and upload to the shore file. The ship's 3-M Coordinator is crucial in ensuring the timely update of these 4790/2Ks to the shore file for action by RSG, and acts as the link between TARGET and RSG. Figure 4 outlines the process that occurs from discovering the discrepancy, to repair or deferral the discrepancy, to the visit debrief. Typical TARGET visits achieve a 60-65% repair completion rate, with the remainder screened to future availabilities or continuous Ship's Force (i.e., organizational or "O") level maintenance.

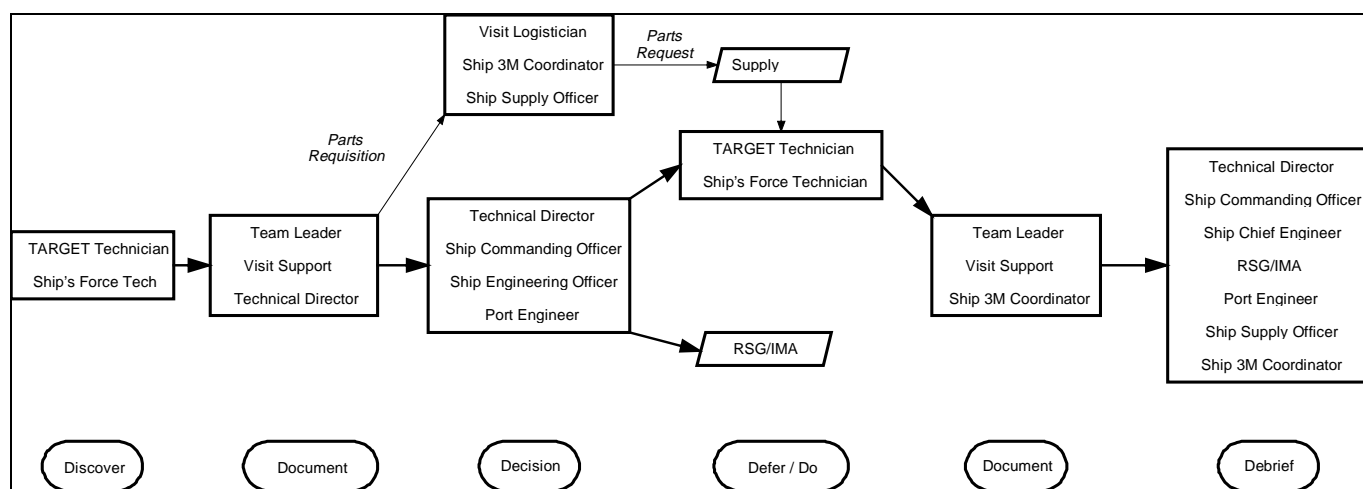


Figure 4 - The TARGET Process

At the conclusion of each day, the Technical Director meets with the various team leaders to discuss the day's events and prepare for the next day. This often drives changes to the assessment agenda because of the dynamic nature in assessing operational equipment. The required equipment tag-outs and safety checks are identified and coordinated for the next day by the assistant Technical Director and ship's duty engineer.

The TARGET visit teams work with Ship's Force to assist the sailors in accomplishing as much work as possible given the nature of the repairs and the availability of parts. For those jobs that require parts, TARGET logisticians research, order and expedite delivery in order to allow as much time as possible for completion during the visit. TARGET logisticians also coordinate the submission of feedback reports (4790/CKs, FCFBRs, etc.) and a final synopsis of the visit results for the outbrief by the TARGET Technical Director. The visit debrief is held onboard with the ship's Commanding Officer, officers and crew, RSG, IMA, Port Engineer, and any other interested parties.

The outcome of each TARGET visit depends on the cooperation and coordination of everyone involved. It is truly a "team" effort. Figure 5 shows a brief synopsis of the roles of all the personnel required for the success of the TARGET visit. The interdependency of everyone involved is one of the critical aspects of TARGET.

A unique aspect of the TARGET program is that neither grades nor discrepancy reports are submitted to the ship's chain of command following the visit. All discrepancies are documented within the CSMP and reported using the 3-M system. Great care and effort is taken to ensure that the data generated from each visit and used in the measures of effectiveness is kept anonymous. The main body of discrepancy data and other information is evaluated and analyzed independent of the ship's identity, except to isolate unique problems that need additional technical research or attention. Specific problems not resolved on board a particular ship can result in a follow-on technical assist by FTSCLANT as requested.

A program review (usually monthly) of the TARGET program and SNAPSHOTS is held jointly by FTSCLANT, SUPSHIP Code 200 and COMNAVSURFLANT. This review includes discussing the overall results of the TARGET program visits, lessons

learned, suggestions from the fleet, and recommendations by the Technical Directors. The purpose of the program review is to continually improve both the shipboard visit process and the overall TARGET program process that supports each visit.

<ul style="list-style-type: none"> • Technical Director <ul style="list-style-type: none"> – Equipment Assessment List – Visit Preparation – Overall Visit Conduct – Equipment Assessment/Test Agenda – Discrepancy “Risk Assessments” – Measures of Effectiveness – Design Issue Identification • Visit Team Leader/Member <ul style="list-style-type: none"> – Equipment Assessment – Discrepancy Documentation – Expert Repair Assistance – Deckplate Maintenance Training – Tagouts • Visit Logistician <ul style="list-style-type: none"> – Repair Parts Research, Ordering Assist, Delivery Expediting – 4790/2K & 4790/CK Generation – Daily Discrepancy Updates – Daily Repair Parts Update • Ship’s Commanding Officer <ul style="list-style-type: none"> – Equipment Assessment List – Ship’s Force Participation – Discrepancy Screening Decision 	<ul style="list-style-type: none"> • Ship’s Engineer Officer <ul style="list-style-type: none"> – Equipment Assessment List – Equipment Assessment/Test Agenda – Discrepancy Screening Decision • Ship’s 3-M Coordinator <ul style="list-style-type: none"> – Discrepancy 2-Kilo SNAP Processing – 2-Kilo Daily Update to RSG • Ship’s Supply Officer <ul style="list-style-type: none"> – Repair Parts Ordering – Onboard Repair Parts Management • Ship’s Force Technician <ul style="list-style-type: none"> – Equipment Assessment – Discrepancy Repairs – Tagouts • Port Engineer <ul style="list-style-type: none"> – Equipment Assessment List – Discrepancy Screening Decision • RSG/IMA <ul style="list-style-type: none"> – Discrepancy Screening Decision – Discrepancy Repairs
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Figure 5 - People Who Make TARGET Happen

TECHNICAL ISSUES: DATA TO INFORMATION TO ACTION

A major strength of the TARGET program lies in its technical competency, progressive outlook, and continued focus on the “right” issues. As an example of how TARGET managers measure the technical results of visits, Figure 6 shows a Pareto-style chart of FFG 7 class, TARGET-found discrepancies. This chart displays the total number of discrepancies written during thirty ship visits.

Every surface ship class is evaluated using similar charts to monitor total system and component discrepancies, parts costs, repair completion percentages, etc. In this way, TARGET continually monitors visit results and is able to improve the process by focusing resources on those issues most in need of attention. Previously, selected systems were inspected year after year with inadequate attention paid to measurement, evaluation, and process feedback. As a result, many “good” engineering systems were inspected excessively, while other “poor performers” may not have been assessed at all.

For example, main propulsion reduction gears, sea water service pumps, and main propulsion shafting were assessed for many years but few discrepancies were reported. However “troubled” systems, such as the Engineering Control and Surveillance Systems (ECSS, or Control Consoles) and the High Pressure air piping on FFG 7 class ships were not assessed as part of a regular program, despite the fact that both systems were recommended to the COMNAVSEASYS COM Detection, Action, Response and Tracking (DART) [2] program due to the enormous problems with these systems. TARGET assesses all systems agreed upon as described

earlier and measures the assessment results to ensure continued attention is placed on needy systems. TARGET also conducts a full analysis on the deckplate required during the visit. This ensures immediate documentation of “as found” conditions and the solutions that are being used. This improvement was an objective of the AEC program [3], which is now being satisfied by TARGET.

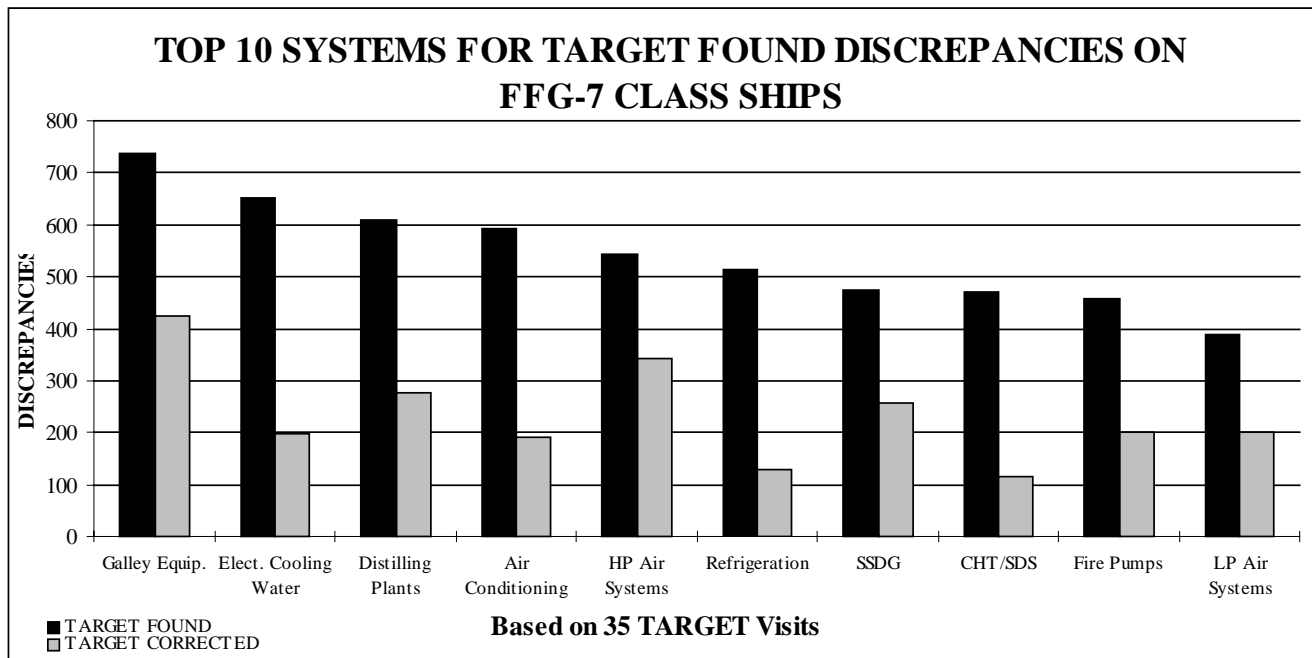


Figure 6 - FFG-7 Top 10 Discrepancies Discovered

TARGET places experienced field engineers and technicians on the deckplate assisting Ship's Force with machinery assessments and repair actions. This greatly improves the technical quality of the visit, the training level of the sailor, and the speed of 4790/2K submission and closure. Moving analysis to the deckplate and increasing repair/training efforts were objectives of the original AEC program. TARGET and AEC, by providing pre- and post-deployment assessments, now accomplish these objectives. Steady increases in customer satisfaction indicates these improvements are working well. (see the Measures of Effectiveness section of this paper).

One of the key technical issues noted during TARGET visits and well documented by ship submitted CASREPs, concerned the HFC-134A refrigerant conversions being accomplished as SHIPALT FFG 7-300K. In general, these conversions have been successful, however, some problems on FFG 7 class ships had been noted following installation of this alteration. Note that in Figure 6, the Refrigeration and Air Conditioning systems total nearly 600 discrepancies from thirty five ship visits. Certain ships have experienced erratic swings in superheat temperatures, refrigerant floodback and sludge-like formations in internal system components. Sample analysis and subsequent follow-on testing at NSWCCD identified that moisture and presence of trace mineral oil created these conditions. Higher standards of cleanliness and improved grades of polyolester (POE) oil have since substantially eliminated early conversion problems. As a note of interest, these symptoms have not been experienced by all ships receiving the conversion.

As a result of recent TARGET findings on two FFGs, COMNAVSEASYS COM and NSWC CD have agreed to add solid-core dehydrators, Shraeder evaporator coil drain valves, and a prototype oil to resolve some of the experienced difficulties. These additions are being studied as possible class-wide solutions for ships experiencing these problems. TARGET is modifying its assessment and training procedures to ensure that these problems are addressed carefully during TARGET visits with the results forwarded to COMNAVSEASYS COM for class-wide action.

TARGET has vigorously addressed the Navy-wide problems with High Pressure Air Compressors and air systems, particularly aboard the FFG 7 class. In January 1995, TARGET introduced the HP Air System Drop Test to the program to attack leaks throughout HP air systems. These leaks contribute to extreme amounts of excessive compressor operating hours, leading to premature air end failures and high fuel usage. Costs for HP air compressor repairs and parts for COMNAVSURFLANT and COMNAVSURFPAC exceeded 15 million dollars during 1995.

Because TARGET was able to so quickly and accurately show the need for broad fleet attention to reducing HP air leaks, COMNAVSURFLANT and FTSC LANT sent a message to all FFG 7 class ships instructing them to perform HP air drop tests and repair all leaks noted. NSSW CD has also distributed air groom manuals and PMS procedures. Ideally, this test should occur just prior to the start of a TARGET visit to allow more time for repair assistance while TARGET subject matter experts are on board and available.

NSWC CD has updated APLs and repair kits using improved Viton elastomer for HP air valve repair at the "O" and "T" levels. This includes APL changes and development of HP air system repair kits. The benefit of immediate detection and repair to the HP air system has proven positive as the results of an actual DD drop test are shown in Figure 7 [5].

Steering systems have also received a great deal of attention by TARGET and COMNAVSURFLANT. Ships had been receiving pre-deployment inspections or quasi "certifications" by Shore Intermediate Maintenance Activities (SIMAs) for many years. At the same time, there were TARGET and AEC assessments covering the same steering equipment. However, these assessments and "certifications" were using different criteria to assess the same equipment. To overcome this dichotomy, FTSC LANT, in conjunction with NSWC CD, COMNAVSEASYS COM, and COMNAVSURFLANT, developed a standard assessment criteria that is ship class specific and ensures consistency in assessments. Further consistency is accomplished by using a single activity to conduct the assessments.

After October 1995, TARGET steering assessments satisfied the pre-deployment inspection requirement. This change has been reflected in COMNAVSURFLANT maintenance policy.

Another technical area receiving considerable attention by TARGET is the Electronic Control and Surveillance Systems, or ECSS. ECSS equipment was not previously covered during either the AEC, ASRR, nor GTRR programs and was largely supported only during specific technical assists visits or during POT&I visits. This lack of attention resulted in ships struggling to pass OPPEs, INSURVs, etc., because their CSMPs did not normally reflect all ECSS problems subsequently discovered by the inspection teams. The Ship's Force in general were not properly equipped nor skilled in detecting problems with ECSS prior to failure.

ECSS problems over the years have cost millions of dollars and resulted in these systems being nominated to the DART program for flag-level attention within COMNAVSEASYS COM. TARGET now fully assesses ECSS equipment, which normally identifies a large number of costly discrepancies, but this cost is significantly less than repairs following total console failure. Because of the scope and complexity of the ECSS equipment, COMNAVSURFLANT occasionally funds FTSC LANT to conduct phased ECSS technical assists that begin approximately one year prior to a ship's regular overhaul (ROH) and continuing through the LOE. At present, the CG 47 and DD 963 class ships receive this phased approach when a ROH is planned, which is atypical of the standard approach for TARGET systems.

The TARGET program also supports additional maintenance efforts. Sea valve assessments have been added to the TARGET visit equipment list to accumulate 3-years of assessment data as part of the data collection process for COMNAVSURFLANT's proactive maintenance initiative.

TARGET teams continue using standard, condition-based assessment tools like vibration analysis, infra-red thermography, flow test meters, and double-dial indicator inspections that were introduced by the AEC program and its forerunner, SEMMSS (Systems and Equipment Maintenance Monitoring for Surface Ships). These tools are now used in conjunction with machinery performance tests conducted by the TARGET engineers and technicians.

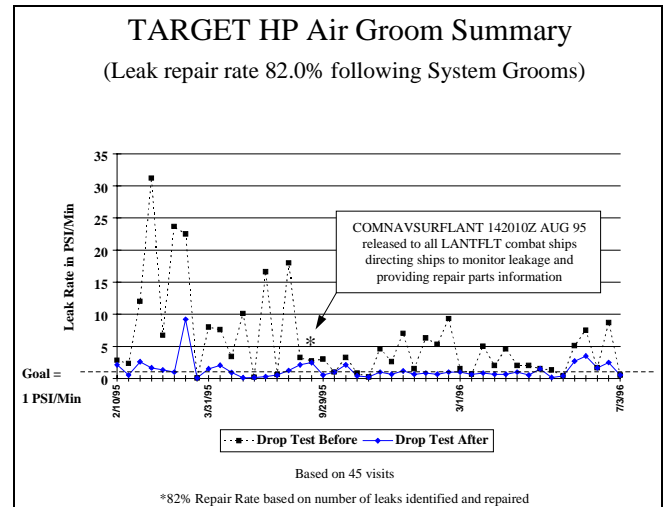


Figure 7 - HP Air Drop Test Summary

LINKS TO OTHER PROCESSES: TARGET AND NAVY MAINTENANCE

Keeping ships operating at their peak efficiency requires careful integration of both man and machine. Many Navy maintenance programs exist to ensure that ships are prepared to go to sea and carry out their mission. TARGET is working closely with some of these to establish a cooperative link which will serve to help the ship and crew better than when the programs work independent of one another.

For instance, TARGET management is working closely with the INSURV Board to develop shared information databases and procedures. Members of INSURV have visited ships undergoing TARGET visits to see first-hand how TARGET assesses machinery, documents findings and assists with repair actions. Based upon mutual observation by each command of the other's programs, managers within FTSCANT, INSURV and COMNAVSURFLANT envision future INSURV visits utilizing TARGET results to satisfy INSURV program requirements.

FTSCANT officially began providing deckplate support during INSURV visits in October 1995. Previously, NSWC CD provided most of the deckplate support for INSURV with FTSCANT providing limited support. Now that FTSCANT is supporting both TARGET and INSURV, the engineers and technicians executing the visits are finding considerable similarity in the assessment procedures and processes for each program. Therefore, a ship having a high quality CSMP, developed with the assistance of TARGET, may well be considered materially acceptable to the INSURV Board. This vision is not too far from reality today.

The trend towards developing this form of cooperative effort is further enhanced by the close cooperation between TARGET and its Combat Systems counterpart, the CSRR. In fact, since late 1994, TARGET and CSRR visits have routinely been scheduled together as much as possible. The bottom line philosophy is to keep the "pain threshold" inflicted on the ship very brief, albeit intense, then depart and leave the ship alone. As these two visits become more intertwined, a vision of a future ship-wide comprehensive visit begins to become possible.

But more than a possibility is the vision of the growing link between TARGET, Continuous Maintenance, and the Integrated Fleet Maintenance Management (IFMM) process. Because of TARGET's key position in the maintenance cycle, it plays an important role in defining the maintenance strategies, and developing methodologies for assessment techniques, repair standards, and risk assessments. TARGET and SUPSHIP are working closely to document deferred maintenance actions, especially "Z" items, which are time-based repairs. This effort requires close cooperation with port engineers, who assist the ships with CSMP management throughout the maintenance cycle.

Because all TARGET repair actions beyond the "O" level are brokered by RSG, TARGET's dependence upon a close partnership with the RSGs and IMAs cannot be overemphasized. Since repair decisions are being made based on TARGET recommendations, TARGET technicians are becoming better attuned to the needs and concerns of the repair community as well as the operational concerns of ships's Commanding Officers. This is resulting in an increased emphasis on providing "risk assessments" during the visit.

TARGET also plays a key role in helping to evaluate new maintenance technology that is being developed. TARGET is connected with the Integrated Condition Assessment System (ICAS) currently being installed aboard ship via MACHALT 406 [5]. ICAS provides ships with a complete database for logging engineering plant information directly from control console data buses, walk-around data loggers, or direct keyboard entry. ICAS utilizes this database to generate repair recommendations, performance trends, etc. As ICAS matures and sailors become accomplished users, TARGET teams can access historical data via INTERNET weeks or months ahead of scheduled TARGET visits. This will allow for improved tailoring of the TARGET visits.

In summary, TARGET is linked to virtually all major maintenance initiatives currently ongoing in the U.S. Surface Fleet. TARGET strives to be in harmony with each of these initiatives to ensure that a high-quality and consistent service is provided to the fleet.

MEASURES OF EFFECTIVENESS; TOOLS FOR CONTINUOUS IMPROVEMENT

In order to monitor the progress of the TARGET program and identify areas of opportunity for improvement within the process, a number of measures of effectiveness (MOEs) have been instituted. The MOEs fall into four basic categories: equipment discrepancy-based, maintenance management-based, logistics support-based, and customer response-based. The information from the MOEs is used to enhance the TARGET process directly and to permit insight into other processes that affect the ship's material condition status. The MOE information is reviewed and analyzed both in the context of each individual visit and over the life-cycle of the TARGET program.

The equipment discrepancy-based MOEs allow for review of the equipment being assessed and two different levels of action. First, equipment which TARGET data indicates as having a low discrepancy rate is recommended for decreased scrutiny. The time and effort previously afforded that equipment can now be spent on equipment which needs additional attention or on new equipment introduced into the program for assessment. Secondly, the statistical and technical data generated by the MOEs provides key information for both specific equipment repair or life-cycle maintenance attention, and for class-wide problem identification.

The maintenance management-based MOEs focus both on the shipboard process of documenting and managing repairs, and on the response and support by the shore community. Specifically, TARGET reviews the current items within the CSMP for those systems being assessed and provides recommendations for any needed corrections. The “half-life” of a TARGET visit is being measured by these MOEs as the number of technical assist visits and CASREPs from the end of the TARGET visit to the end of the deployment are measured. The lasting effects of TARGET can also be reflected by the improved performance of Ship’s Force during operational evaluations.

The logistics support-based MOEs include data on technical and parts support feedback that are submitted based on process discrepancies noted during the TARGET visit, and data on supply system parts support, including any delays encountered. These MOEs allow for identifying problems and making recommendations to those logistics processes that exist within the shore infrastructure and extend to the ship for the purpose of supporting a ship’s ability to maintain itself. Accumulating the data from the visits allows for recommendations to supply and integrated logistics support (ILS) processes to enhance the ship’s parts allowance, technical manual quality, PMS coverage, and configuration management records. Figure 8 shows data collected on a number of logistics measures of effectiveness as part of the analysis process.

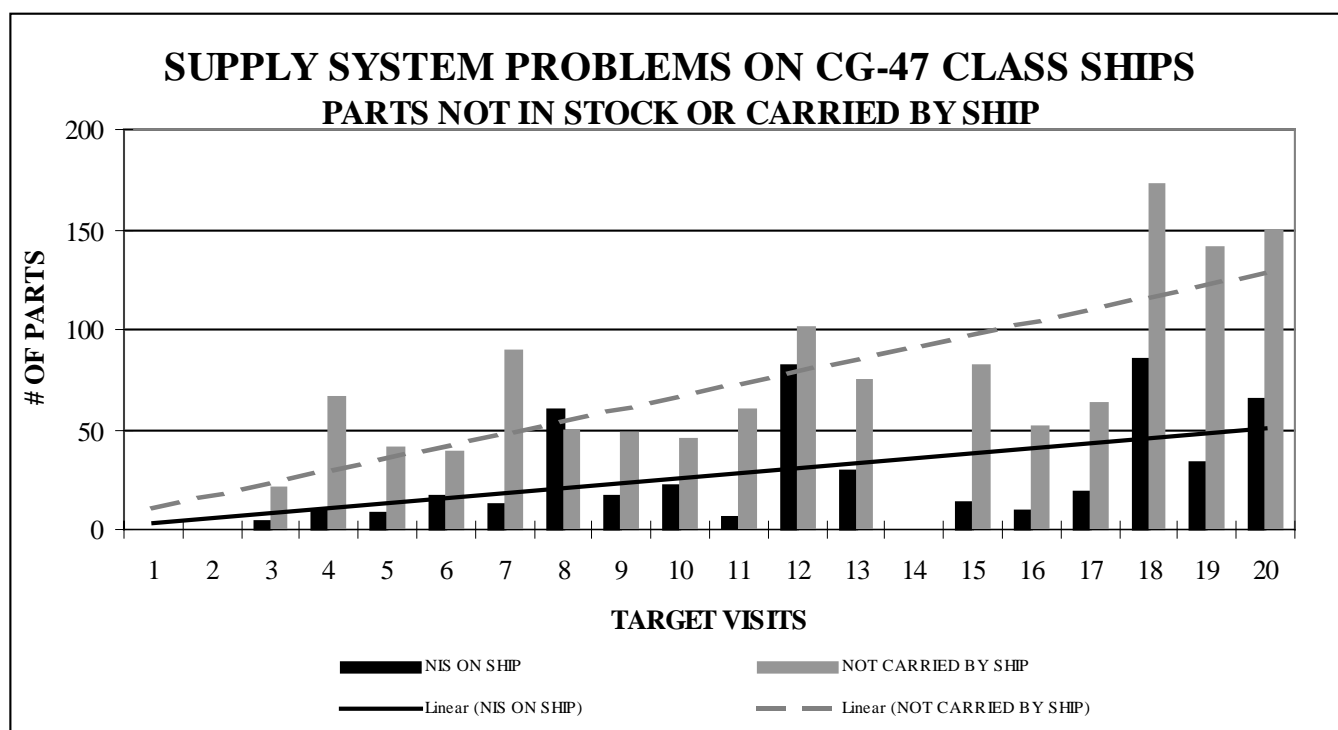


Figure 8 – Logistic Support MOE

The last MOE category is the most direct measure of how the TARGET program is received and perceived by the fleet; customer response-based MOEs. The mainstay of this category is the customer ship satisfaction surveys that are collected at the end of every TARGET visit. These surveys contain the critical information of how the program is perceived by the ship and allows an avenue for recommendations and suggestions directly from the TARGET customer. Figure 9 is an example of the customer ship satisfaction. As part of continuous improvement, the customer survey sheets were modified last year to allow Ship’s Force to expand on their recommendations and suggestions.

In fact, continuous improvement is at the heart of the process management of the TARGET program. Each visit is a unique evolution and specifically tailored for that ship at that point of time in the ship’s life. The overall program process provides the support that allows each visit to respond in such a manner to each ship.

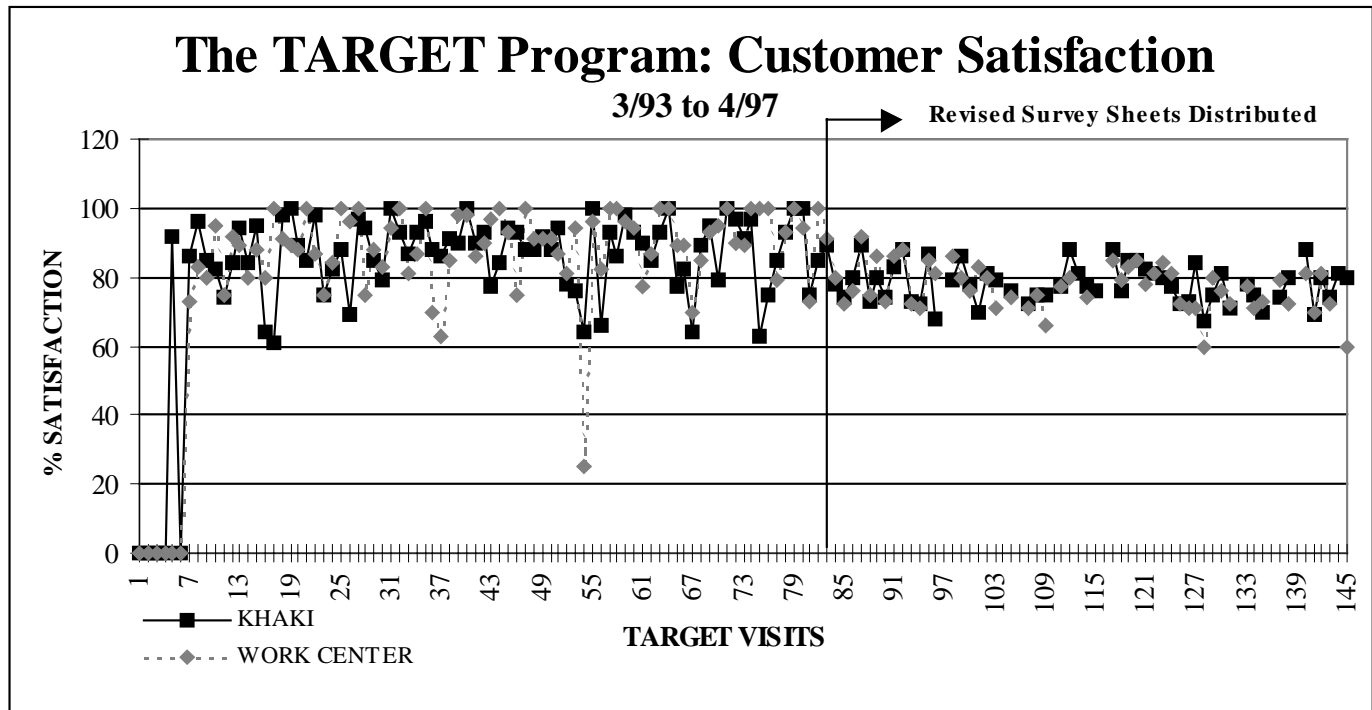


Figure 9 – Customer Satisfaction MOE

TARGET's FUTURE; SMARTER, FASTER, AND LEANER

By remaining dynamic in nature and responsive to the needs of the fleet, TARGET will maintain its ability to improve and meet new challenges. Future improvements include:

- Continued development and official promulgation of MAIs for all ship classes. This will ensure Ship's Force, port engineers and maintenance managers are aware of system assessment responsibilities within the shore community and aboard ship.
- Finalize development of an agenda building process and streamline the TARGET process.
- Closer, more effective coordination between CSRR and TARGET during joint visits. Visit planning, execution, and discrepancy documentation will be consolidated and streamlined, making both efforts more efficient.
- Improved automation of 4790/2K processing, supply part requisition and documentation, discrepancy data collection and analysis, and information data exchange. This will allow more efficient allocation of TARGET resources and faster response from shore-based support processes.
- Enhanced, formal communication of visit MOEs to COMNAVSURFLANT, and the technical and logistics communities ashore to address discrepancy trends, design recommendations, assessment requirements, and "problem" equipment identification.
- Expanded deckplate training and awareness of the FTSC/LANT-developed "Tech Rep on a Disk" (TROD) system during the course of the TARGET visits. This will enhance the sailor's knowledge of the onboard diagnostic tools available to them, and provides lessons learned for improvement of the TROD and its impact with the expert system diagnostics being embedded into ICAS.
- Incorporation of additional systems/equipment not previously assessed under condition-based criteria, such as sea valves which were replaced by a time-directed requirement, regardless of the material condition.
- Expansion of the program to provide the same services to the submarine community. Two submarine TARGET visits are scheduled for FY 97.

The role of configuration data management and its impact on parts availability and proper loading out of onboard spares is also being reviewed as more data from the logistics MOEs becomes available. This will affect not only the immediate parts availability for repairs during a TARGET visit, but the ability to the Ship's Force in general to maintain their ship.

But regardless of the introduction of high-tech innovations such as ICAS, or sophisticated process management design like IFMM, the bottom line remains with the technical expert and the sailor working side-by-side. Every other aspect of TARGET serves to support that basic and fundamental goal - helping the sailor to keep his equipment operational while at sea.

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- [1] Dolence, Donald, "The Real Combat Zone," Fleet Maintenance Symposium '95, Technical Paper.
- [2] The DART Program has since been replaced by the Top Management Attention/Top Management Issues (TMA/TMI) Process. See "TMA/TMI: Readiness Based Issues to Planning Solutions", Fleet Maintenance Symposium '97, Technical Paper by Harris, Golden and Hepburn.
- [3] Jacobs, Olsen, and Horten, "Assessment of Equipment Condition: The key to implementing CBM aboard ship," *Surface Warfare Magazine*, vol. 19, no. 3, May/June 1994, pp. 28-33.
- [4] COMNAVSURFLANT NORFOLK VA 180001Z MAY 95.
- [5] See "Air Systems Maintenance: A New Partnership," Golden and Balsly.
- [6] Jacobs, Cieri, Mazzeo, and Olsen, "ICAS improves shipboard maintenance," *Surface Warfare Magazine*, vol. 19, no. 5, Sep/Oct 1994, pp. 28-31.

GLOSSARY

AEC	Assessment of Equipment Condition
CART	Command Assessment of Readiness and Training
CSRR	Combat Systems Readiness Review
EQOL	Enhanced Quality of Life
FEP	Final Exercise Period (Final Phase of TSTA)
FMAV	Fleet Maintenance Availability
INSURV	Inspection and Survey
LOA	Light Off Assessment
MAI	Master Assessment Index
MCA	Material Condition Assessment (ISIC)
MSA	Material Self Assessment (Ship's Force)
PARSE	Program for Assessment and Repair of Shipboard Elevators
POM	Pre-Overseas Movement
SCIP	Ship Crane Improvement Program
SDPS	Sonar Dome Pressurization System
TARGET	Technical Assessment, Repair, Groom, and Evaluation Team
TSTA	Tailored Ship's Training Availability